



SFB1425 - Heterocellular Nature of Cardiac Lesions: Identities, Interactions, Implications

P11-2: PhD-Project based at the Lab for Bio- and Nano-Photonics, IMTEK

Nano-Structural Basis for Mechanical Fibroblast-Cardiomyocyte Cross-Talk

Background

Many scars are a-cellular and mainly composed of fibrillar collagen. In the heart however, fibrotic tissue is much 'alive', with the ubiquitous network of the extracellular matrix (ECM) providing a scaffold for structural and mechanical integration of cells embedded within it – mainly cardiomyocytes (CM) and fibroblasts (FB). What are the scar microstructures that arise following cardiac injury? What are the factors that influence the interaction between CM and FB during lesion development? Only recently it was hypothesised that FB interact with CM via integrin-guided tunneling nanotubes (TNT), which is supposed to integrate CM within the ECM.

Project Description

The fragile nature of the 100 nm thin TNT diameter make it difficult to monitor TNT structure and behaviour in living cells. Therefore all we will use Rotating Coherent Scattering (ROCS) microscopy, a novel method for label-free fast super-resolution imaging (with 150 nm spatial and 100 Hz temporal resolution) in combination with optical tweezers and MHz thermal noise tracking of attached nano-beads and TNT, to monitor their changing mechanical behavior over time.

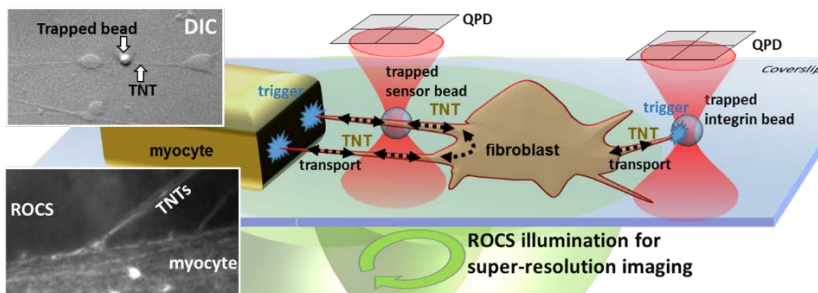


Figure: Interaction measurements of cardiomyocyte with fibroblast via TNT using rotating coherent scattering microscopy, optical tweezers and thermal noise tracking.

Qualifications and Requirements

- High motivation to work on a state-of-the-art research topic in a highly dynamic, interdisciplinary and supportive environment
- Solid background/strong interest in biophysics and microscopy/tweezers
- Excellent MSc in a field relevant for the proposed study
- English language proficiency at level B2 or higher

Research Areas

Biophysics & Optics

Experimental Tasks

- Live cell super-resolution imaging and manipulation
- Biophysical characterisation of cell-cell interactions
- Thermal noise tracking
- Optical tweezing
- Advanced data analysis and computer modeling

Student Background

Physics and Engineering, in particular Biophysics and optics

Starting Date

from 01/07-2020

PhD Advisor

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Joint project with Eva Rog-Zielinska, IEKM

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Applications via

[SGBM portal](#)

Submission window: 08-30/06-2020

